



# Residential Plans Examiner Review Form for HVAC System Design (Loads, Equipment, Ducts)

101-E Mounts Bay Road, P. O. Box 8784 Williamsburg, VA 23187-8784  
PHONE: (757) 253-6626 FAX: (757) 259-4038 E-Mail: codecomp@james-city.va.us

Form  
RPER 1  
15 Mar 09

Contractor _____	REQUIRED ATTACHMENTS	ATTACHED
Mechanical License # _____	Manual J1 Form (and supporting worksheets):	Yes <input type="checkbox"/> No <input type="checkbox"/>
Building Plan # _____	or MJ1AE Form* (and supporting worksheets):	Yes <input type="checkbox"/> No <input type="checkbox"/>
Home Address (Street or Lot#, Block, Subdivision) _____	OMB performance data (heating, cooling, blower):	Yes <input type="checkbox"/> No <input type="checkbox"/>
	Manual D Friction Rate Worksheet:	Yes <input type="checkbox"/> No <input type="checkbox"/>
	Duct distribution system sketch:	Yes <input type="checkbox"/> No <input type="checkbox"/>

## HVAC LOAD CALCULATION (IRC M1401.3)

### Design Conditions

#### Winter Design Conditions

Outdoor temperature \_\_\_\_\_ °F  
Indoor temperature \_\_\_\_\_ °F  
Total heat loss \_\_\_\_\_ Btu

#### Summer Design Conditions

Outdoor temperature \_\_\_\_\_ °F  
Indoor temperature \_\_\_\_\_ °F  
Grains difference \_\_\_\_\_ Δ Gr @ \_\_\_\_\_ % Rh  
Sensible heat gain \_\_\_\_\_ Btu  
Latent heat gain \_\_\_\_\_ Btu  
Total heat gain \_\_\_\_\_ Btu

### Building Construction Information

#### Building

Orientation (Front door faces) \_\_\_\_\_  
North, East, West, South, Northeast, Northwest, Southeast, Southwest

Number of bedrooms \_\_\_\_\_

Conditioned floor area \_\_\_\_\_ Sq Ft

Number of occupants \_\_\_\_\_

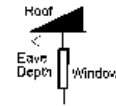
#### Windows

Eave overhang depth \_\_\_\_\_ Ft

Internal shade \_\_\_\_\_

Blinds, drapes, etc. \_\_\_\_\_

Number of skylights \_\_\_\_\_



## HVAC EQUIPMENT SELECTION (IRC M1401.3)

### Heating Equipment Data

Equipment type \_\_\_\_\_  
Furnace, Heat pump, Boiler, etc.  
Model \_\_\_\_\_  
Heating output capacity \_\_\_\_\_ Btu  
Heat pumps - capacity at winter design outdoor conditions  
Auxiliary heat output capacity \_\_\_\_\_ Btu

### Cooling Equipment Data

Equipment type \_\_\_\_\_  
Air Conditioner, Heat pump, etc.  
Model \_\_\_\_\_  
Sensible cooling capacity \_\_\_\_\_ Btu  
Latent cooling capacity \_\_\_\_\_ Btu  
Total cooling capacity \_\_\_\_\_ Btu

### Blower Data

Heating CFM \_\_\_\_\_ CFM  
Cooling CFM \_\_\_\_\_ CFM  
Static pressure \_\_\_\_\_ IWC  
Fan's rated external static pressure for design airflow

## HVAC DUCT DISTRIBUTION SYSTEM DESIGN (IRC M1601.1)

Design airflow \_\_\_\_\_ CFM  
External Static Pressure (ESP) \_\_\_\_\_ IWC  
Component Pressure Losses (CPL) \_\_\_\_\_ IWC  
Available Static Pressure (ASP) \_\_\_\_\_ IWC  
ASP = ESP - CPL  
Longest supply duct: \_\_\_\_\_ Ft  
Longest return duct: \_\_\_\_\_ Ft  
Total Effective Length (TEL) \_\_\_\_\_ Ft  
Friction Rate: \_\_\_\_\_ IWC  
Friction Rate = (ASP x 100) ÷ TEL  
Duct Materials Used (circle)  
Trunk Duct: Duct board, Flex, Sheet metal, Lined sheet metal, Other (specify) \_\_\_\_\_  
Branch Duct: Duct board, Flex, Sheet metal, Lined sheet metal, Other (specify) \_\_\_\_\_

I declare the load calculation, equipment selection, and duct system design were rigorously performed based on the building plan listed above. I understand the claims made on these forms will be subject to review and verification.

Contractor's Printed Name \_\_\_\_\_ Date \_\_\_\_\_  
Contractor's Signature \_\_\_\_\_

\* Home qualifies for MJ1AE Form based on Abridged Edition Checklist.

## Step 1 Checking for omissions

- design conditions - winter outdoor \_\_\_\_ indoor \_\_\_\_ Summer outdoor \_\_\_\_ indoor \_\_\_\_
- orientation \_\_\_\_ Shading factor default - 45degrees
- Occupant Load # of bedrooms \_\_\_\_ + 1 = \_\_\_\_ total occupants
  - equipment listed compares to specs given
- all blanks filled in including contractor's information at top with
  - name signed and dated at the bottom of the form.

# Step 2

## comparing cooling equipment to heat gain

Total cooling capacity of  
equipment

- Check to see if all blanks are filled in and pertain to equipment listed and design

divided by

heat gain

Will show if %s are with in  
ACCA allowances according to  
the manual S selection sizing table  
M1401.3

**James City County**  
Residential Plans Examiner Review Form  
for HVAC System Design (Loads, Equipment, Ducts)  
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Form  
RPER 1  
15 Mar 09

Contractor \_\_\_\_\_  
Mechanical License # \_\_\_\_\_  
Building Plan # \_\_\_\_\_  
Home Address (Street or Lot#, Block, Subdivision) \_\_\_\_\_

**REQUIRED ATTACHMENTS**

	Yes	No
Manual J1 Form (and supporting worksheets):	<input type="checkbox"/>	<input type="checkbox"/>
or MJ1AE Form* (and supporting worksheets):	<input type="checkbox"/>	<input type="checkbox"/>
OEM performance data (heating, cooling, blower):	<input type="checkbox"/>	<input type="checkbox"/>
Manual D Friction Rate Worksheet:	<input type="checkbox"/>	<input type="checkbox"/>
Duct distribution system sketch:	<input type="checkbox"/>	<input type="checkbox"/>

**HVAC LOAD CALCULATION (IRC M1401.3)**

Design Conditions		Building Construction Information	
<b>Winter Design Conditions</b>		<b>Building</b>	
Outdoor temperature _____ °F		Orientation (Front door faces) _____	
Indoor temperature _____ °F		North, East, West, South, Northwest, Northeast, Southwest	
Total heat loss _____ Btu		Number of bedrooms _____	
<b>Summer Design Conditions</b>		Conditioned floor area _____ Sq Ft	
Outdoor temperature _____ °F		Number of occupants _____	
Indoor temperature _____ °F		<b>Windows</b>	
Grains difference _____ Δ Gr _____ % Rh		Eave overhang depth _____ Ft	
Sensible heat gain _____ Btu		Internal shade _____	
Latent heat gain _____ Btu		Blinds, drapes, etc. _____	
Total heat gain _____ Btu		Number of skylights _____	

**HVAC EQUIPMENT SELECTION (IRC M1401.3)**

Heating Equipment Data		Cooling Equipment Data		Blower Data	
Equipment type _____		Equipment type _____		Heating CFM _____ CFM	
Purnace, Heat pump, Boiler, etc.		Air Conditioner, Heat pump, etc.		Cooling CFM _____ CFM	
Model _____		Model _____		Static pressure _____ IWC	
Heating output capacity _____ Btu		Sensible cooling capacity _____ Btu		Fan's rated external static pressure for design airflow	
Heat pumps - capacity at winter design outdoor conditions		Latent cooling capacity _____ Btu			
Auxiliary heat output capacity _____ Btu		Total cooling capacity _____ Btu			

**HVAC DUCT DISTRIBUTION SYSTEM DESIGN (IRC M1601.1)**

Design Data		Duct Materials Used (circle)	
Design airflow _____ CFM	Longest supply duct: _____ Ft	Trunk Duct: Duct board, Flex, Sheet metal, Lined sheet metal, Other (specify)	
External Static Pressure (ESP) _____ IWC	Longest return duct: _____ Ft	Branch Duct: Duct board, Flex, Sheet metal, Lined sheet metal, Other (specify)	
Component Pressure Losses (CPL) _____ IWC	Total Effective Length (TEL) _____ Ft		
Available Static Pressure (ASP) _____ IWC	Friction Rate: _____ IWC		
ASP = ESP - CPL	Friction Rate = (ASP × 100) ÷ TEL		

I declare the load calculation, equipment selection, and duct system design were rigorously performed based on the building plan listed above. I understand the claims made on these forms will be subject to review and verification.

Contractor's Printed Name \_\_\_\_\_ Date \_\_\_\_\_  
Contractor's Signature \_\_\_\_\_

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# Step 3

compare heating equipment to winter design conditions

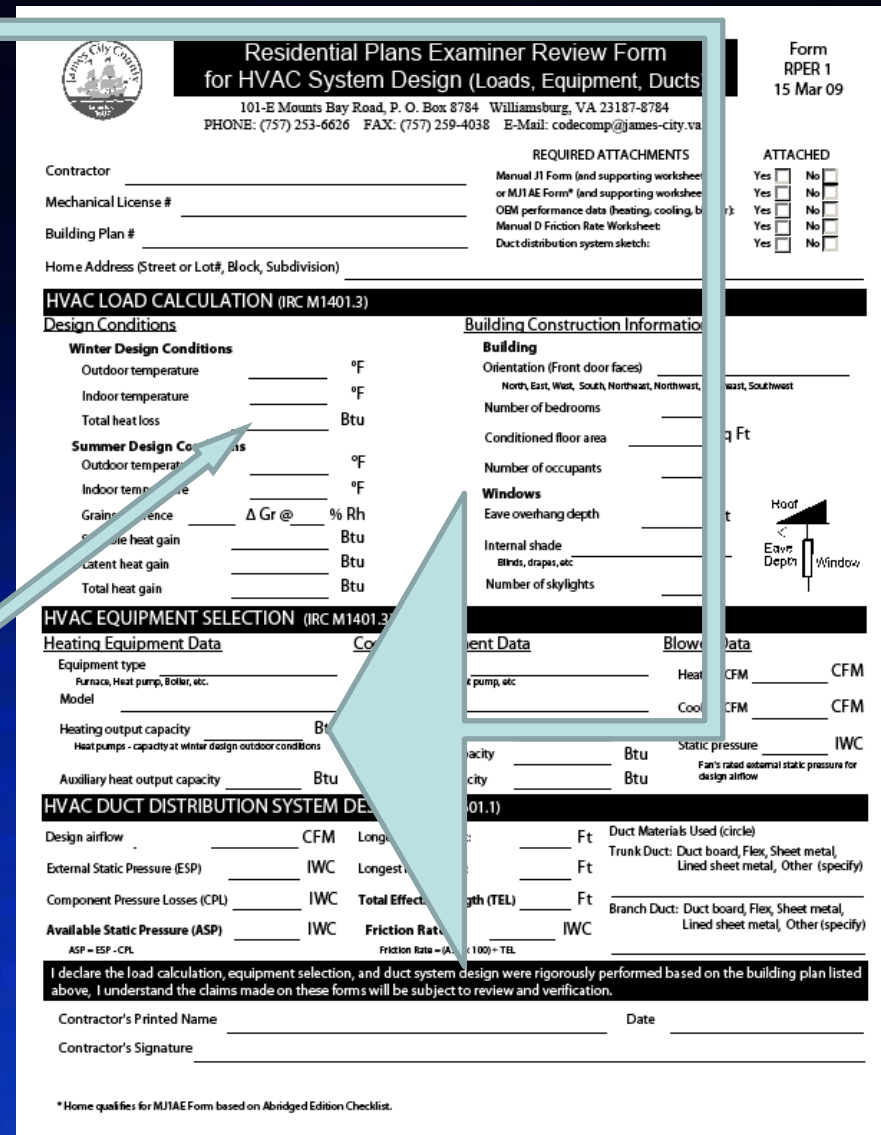
total heating output

capacity

divided by

Winter design  
total heat loss

Will show if % s are with in ACCA  
allowances according to manual S  
selection sizing table M1401.3



The image shows a 'Residential Plans Examiner Review Form for HVAC System Design (Loads, Equipment, Ducts)' from James City County, Virginia. The form is divided into several sections: Contractor information, Required Attachments, HVAC Load Calculation (IRC M1401.3), HVAC Equipment Selection (IRC M1401.3), and HVAC Duct Distribution System Design (IRC M1401.1). The 'HVAC Load Calculation' section includes fields for Winter Design Conditions (Outdoor temperature, Indoor temperature, Total heat loss) and Summer Design Conditions (Outdoor temperature, Indoor temperature, Total heat gain). The 'HVAC Equipment Selection' section includes fields for Heating Equipment Data (Equipment type, Model, Heating output capacity) and Cooling Equipment Data (Equipment type, Model, Cooling output capacity). The 'HVAC Duct Distribution System Design' section includes fields for Design airflow, External Static Pressure (ESP), Component Pressure Losses (CPL), Available Static Pressure (ASP), and Friction Rate. The form also includes a section for Building Construction Information (Building, Windows, Skylights) and a section for Duct Materials Used (Trunk Duct, Branch Duct). The form is dated 15 Mar 09 and includes a signature line for the Contractor's Signature and Date.

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Form RPER 1  
15 Mar 09

REQUIRED ATTACHMENTS  
Manual J1 Form (and supporting worksheet or MJ1AE Form\* (and supporting worksheet)  
OMB performance data (heating, cooling, b...  
Manual D Friction Rate Worksheet  
Duct distribution system sketch:

ATTACHED  
Yes ☐ No ☐  
Yes ☐ No ☐  
Yes ☐ No ☐  
Yes ☐ No ☐

Contractor \_\_\_\_\_  
Mechanical License # \_\_\_\_\_  
Building Plan # \_\_\_\_\_  
Home Address (Street or Lot#, Block, Subdivision) \_\_\_\_\_

**HVAC LOAD CALCULATION (IRC M1401.3)**

**Design Conditions**

**Winter Design Conditions**  
Outdoor temperature \_\_\_\_\_ °F  
Indoor temperature \_\_\_\_\_ °F  
Total heat loss \_\_\_\_\_ Btu

**Summer Design Conditions**  
Outdoor temperature \_\_\_\_\_ °F  
Indoor temperature \_\_\_\_\_ °F  
Grain moisture \_\_\_\_\_ Δ Gr @ \_\_\_\_\_ % Rh  
Sensible heat gain \_\_\_\_\_ Btu  
Latent heat gain \_\_\_\_\_ Btu  
Total heat gain \_\_\_\_\_ Btu

**Building Construction Information**

**Building**  
Orientation (Front door faces) \_\_\_\_\_  
North, East, West, South, Northwest, Northeast, West, Southwest  
Number of bedrooms \_\_\_\_\_  
Conditioned floor area \_\_\_\_\_ sq Ft  
Number of occupants \_\_\_\_\_

**Windows**  
Eave overhang depth \_\_\_\_\_ ft  
Internal shade \_\_\_\_\_  
Blinds, drapes, etc. \_\_\_\_\_  
Number of skylights \_\_\_\_\_

**HVAC EQUIPMENT SELECTION (IRC M1401.3)**

**Heating Equipment Data**  
Equipment type \_\_\_\_\_  
Purnace, Heat pump, Boiler, etc.  
Model \_\_\_\_\_  
Heating output capacity \_\_\_\_\_ Btu  
Heat pumps - capacity at winter design outdoor conditions \_\_\_\_\_ Btu

**Cooling Equipment Data**  
Equipment type \_\_\_\_\_  
Heat pump, etc.  
Model \_\_\_\_\_  
Cooling output capacity \_\_\_\_\_ Btu  
Static pressure \_\_\_\_\_ IWC  
Fan's rated external static pressure for design airflow \_\_\_\_\_

**HVAC DUCT DISTRIBUTION SYSTEM DESIGN (IRC M1401.1)**

Design airflow \_\_\_\_\_ CFM Longest duct run \_\_\_\_\_ Ft  
External Static Pressure (ESP) \_\_\_\_\_ IWC Longest duct run \_\_\_\_\_ Ft  
Component Pressure Losses (CPL) \_\_\_\_\_ IWC Total Effective Length (TEL) \_\_\_\_\_ Ft  
Available Static Pressure (ASP) \_\_\_\_\_ IWC Friction Rate \_\_\_\_\_ IWC  
ASP = ESP - CPL Friction Rate = (ASP / 100) \* TEL

Duct Materials Used (circle)  
Trunk Duct: Duct board, Flex, Sheet metal, Lined sheet metal, Other (specify) \_\_\_\_\_  
Branch Duct: Duct board, Flex, Sheet metal, Lined sheet metal, Other (specify) \_\_\_\_\_

I declare the load calculation, equipment selection, and duct system design were rigorously performed based on the building plan listed above. I understand the claims made on these forms will be subject to review and verification.

Contractor's Printed Name \_\_\_\_\_ Date \_\_\_\_\_  
Contractor's Signature \_\_\_\_\_

\* Home qualifies for MJ1AE Form based on Abridged Edition Checklist.



# Sizing limits

Manual S Equipment Selection Sizing Limitations		
Equipment	Sizing Limits	Reference
Furnaces	100% - 140% of total heating load	Section 2-2
Boilers	100% - 140% of total heating load	Section 2-2
Air conditioners	115% of total cooling load*	Section 3-4
Heat pumps (cooling dominant climates)	115% of total cooling load*	Section 4-4
Heat pumps (heating dominant climates)	125% of total cooling load*	Section 4-4
Supplemental heat (heat pumps)		
• Electric	Based on equipment balance point	Section 4-8
• Dual fuel	100% - 140% of total heating load	Section 6-8
Emergency Heat (heat pumps)	Based on local codes	Section 4-9
Manual S Input for Design Air Flow (Manual D)		
• Heating	Temperature rise requirement	Section 2-6
• Cooling	Air flow associated with the selected equipment's capacity	Section 3-11
* The size of the cooling equipment must be based on the same temperature and humidity conditions that were used to calculate the Manual J loads.		

Manual S Sizing Limitations

# Step4

## Compare design airflow to equipment sizing

$$\text{Sensible heat ratio} = \frac{\text{Sensible heat Gain}}{\text{Total Heat Gain}}$$

compare this number with the numbers from  
SHR table 1-4 manual S below for TD value

Is number ? =      < 80      use 21 TD  
                              between 80-85      use 19 TD  
                              > 85      use 17 TD

$$\text{Airflow} = \frac{\text{sensible heat gain BTU/hr.}}{1.1 \times \text{TD}}$$

Check to see if airflow # CFM in equation above is close to + or - 15% of the design airflow of equipment – may exceed

Design airflow is the higher of either blower data of the heating and cooling equipment

Gas furnace:  
CFM = output BTUs / 1.1 X average temperature rise

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**REQUIRED ATTACHMENTS**

REQUIRED ATTACHMENTS	ATTACHED
Manual J1 Form (and supporting worksheets):	Yes <input type="checkbox"/> No <input type="checkbox"/>
or MJ1AE Form* (and supporting worksheets):	Yes <input type="checkbox"/> No <input type="checkbox"/>
OEM performance data (heating, cooling, blower):	Yes <input type="checkbox"/> No <input type="checkbox"/>
Manual D Friction Rate Worksheet	Yes <input type="checkbox"/> No <input type="checkbox"/>
Duct distribution system sketch:	Yes <input type="checkbox"/> No <input type="checkbox"/>

**HVAC LOAD CALCULATION (IRC M1401.3)**

**Design Conditions**

Winter Design Conditions  
Outdoor temperature \_\_\_\_\_ °F  
Indoor temperature \_\_\_\_\_ °F  
Total heat loss \_\_\_\_\_ Btu

Summer Design Conditions  
Outdoor temperature \_\_\_\_\_ °F  
Indoor temperature \_\_\_\_\_ °F  
Grains difference \_\_\_\_\_ Δ Gr @ \_\_\_\_\_ % Rh  
Sensible heat gain \_\_\_\_\_ Btu  
Latent heat gain \_\_\_\_\_ Btu  
Total heat gain \_\_\_\_\_ Btu

**Building Construction Information**

Building  
Orientation (Front door faces) \_\_\_\_\_  
North, East, West, South, Northwest, Northeast, Southeast, Southwest

Number of bedrooms \_\_\_\_\_  
Conditioned floor area \_\_\_\_\_ sq. ft.  
Number of occupants \_\_\_\_\_

Windows  
Eave overhang depth \_\_\_\_\_ Ft  
Internal shade \_\_\_\_\_  
Blinds, drapes, etc. \_\_\_\_\_  
Number of skylights \_\_\_\_\_

**HVAC EQUIPMENT SELECTION (IRC M1401.3)**

Heating Equipment Data	Cooling Equipment Data	Blower Data
Equipment type _____ Furnace, Heat pump, Boiler, etc.	Equipment type _____ Air conditioner, Heat pump, etc.	Heating CFM _____ CFM
Model _____	Model _____	Cooling CFM _____ CFM
Heating output capacity _____ Btu Heat pumps - capacity at winter design outdoor conditions	Sensible cooling capacity _____ Btu Latent cooling capacity _____ Btu Total cooling capacity _____ Btu	Static pressure _____ IWC Fan's rated external static pressure for design airflow
Auxiliary heat output capacity _____ Btu		

**HVAC DUCT DISTRIBUTION SYSTEM DESIGN (IRC M1601.1)**

Design airflow \_\_\_\_\_ CFM  
Longest supply duct \_\_\_\_\_ Ft  
Longest return duct \_\_\_\_\_ Ft  
External Static Pressure (ESP) \_\_\_\_\_ IWC  
Component Pressure Losses (CPL) \_\_\_\_\_ IWC  
Total Effective Length (TEL) \_\_\_\_\_ Ft  
Available Static Pressure (ASP) \_\_\_\_\_ IWC  
Friction Rate \_\_\_\_\_ IWC  
ASP = ESP + CPL  
Friction Rate = (ASP × 100) ÷ TEL

Duct Materials Used (circle)  
Trunk Duct: Duct board, Flex, Sheet metal, Lined sheet metal, Other (specify) \_\_\_\_\_  
Branch Duct: Duct board, Flex, Sheet metal, Lined sheet metal, Other (specify) \_\_\_\_\_

I declare the load calculation, equipment selection, and duct system design were rigorously performed based on the building plan listed above. I understand the claims made on these forms will be subject to review and verification.

Contractor's Printed Name \_\_\_\_\_ Date \_\_\_\_\_  
Contractor's Signature \_\_\_\_\_

\* Home qualifies for MJ1AE Form based on Abridged Edition Checklist.



# Step 5

## Friction rate work sheet



### Friction Rate Worksheet

#### Step 1) Manufacturer's Blower Data

External static pressure (ESP) = \_\_\_\_\_ IWC      CFM = \_\_\_\_\_

#### Step 2) Device Pressure Losses

Direct expansion refrigerant coil	_____
Electric resistance heating coil	_____
Hot water coil	_____
Heat exchanger	_____
Low efficiency filter	_____
High or mid-efficiency filter	_____
Electronic filter	_____
Humidifier	_____
Supply outlet	_____
Return grille	_____
Balancing damper	_____
Other device	_____
Total device losses (DPL)	_____

#### Step 3) Available Static Pressure

ASP = ESP - DPL = ( \_\_\_\_\_ - \_\_\_\_\_ ) = \_\_\_\_\_ IWC

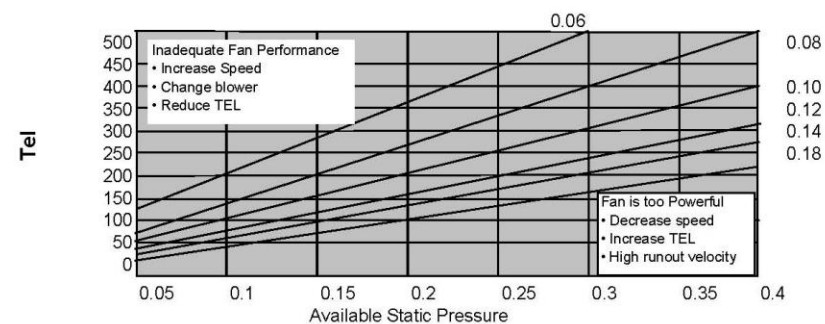
#### Step 4) Total Effective Length (TEL)

Supply-side TEL + Return-side TEL = ( \_\_\_\_\_ + \_\_\_\_\_ ) = \_\_\_\_\_ FEET

#### Step 5) Friction Rate Design Value (FR)

FR value from friction rate chart = \_\_\_\_\_

Make sure all lines that pertain are filled in- including the graph



Look at the "Residential Plans Examiner Review Form" and the Friction Rate Worksheet". Make sure that the friction rate and line lengths compare as noted on both sheets. Use the friction rate to either look up the graph pertaining in "Manual D" appendix 2. Charts 1 thru 10 or use the ACCA rotating wheel to see it CFM compare to the branch or main lines noted on the layout

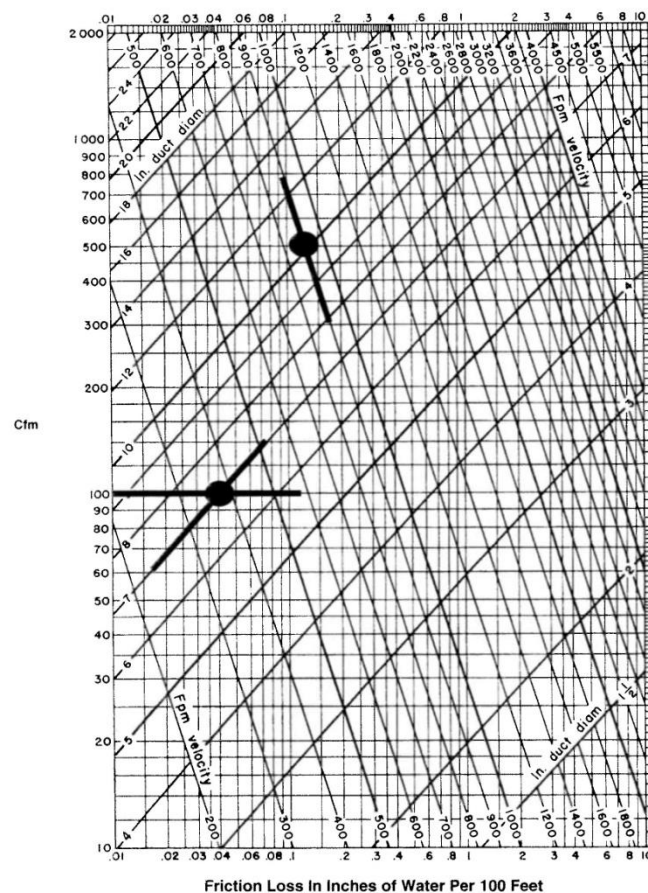




# Duct chart or Duct Rotating Graph

Appendix 2

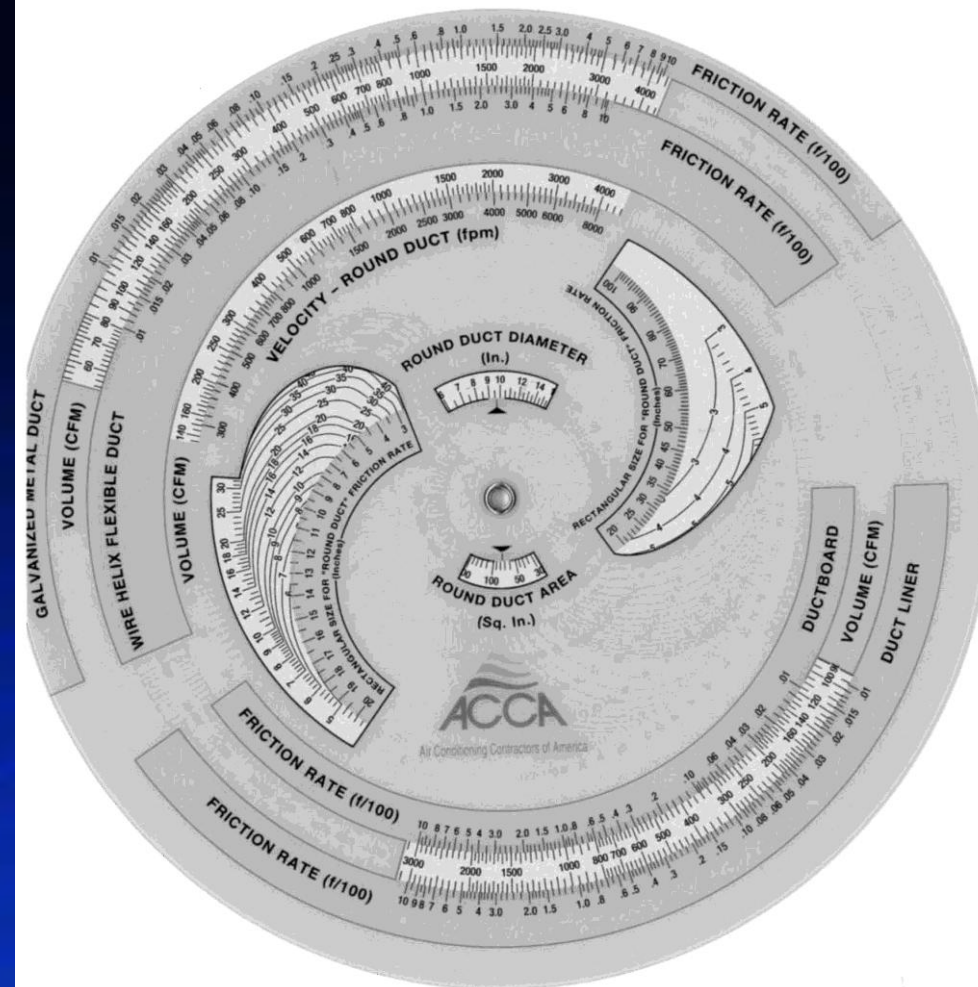
Figure A2-1  
Round Galvanized Metal Duct  
10 Cfm to 2,000 Cfm



Notes:  
1) Correction required for nonstandard air  
2) 40 joints per 100 feet  
3) Roughness = 0.0005 feet

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## DUCT SIZING CALCULATIONS



Duct Materials  
Galvanized metal, wire helix flexible, duct board and duct liner.

Standard Air  
Sea Level 70°F

### INSTRUCTIONS

Use CFM and f/100 to size round duct for a given f/100.  
Use CFM and velocity to size round duct for a given velocity.  
Use CFM and round size to find velocity in round duct.  
Use CFM and round size to find f/100 in round duct.

Use round size and velocity to find CFM in round duct.  
Convert round size to a rectangular size with same f/100.  
Convert diameter to round area.  
See other side for rectangular duct areas and velocities.

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# Table 1 A-Manual J

**Table 1A**  
Outdoor Design Conditions for the United States

Location	Elevation Feet	Latitude Degrees North	Winter	Summer					
			Heating 99% Dry Bulb	Cooling 1% Dry Bulb	Coincident Wet Bulb	Design Grains 55% RH	Design Grains 50% RH	Design Grains 45% RH	Daily Range (DR)
Montpelier/ Barre	1165	44	-6	83	68	8	15	21	M
Rutland	787	43	-8	84	70	18	25	31	M
<b>Virginia</b>									
Charlottesville	870	38	18	91	74	30	37	43	M
Danville AP	572	36	16	92	73	22	29	35	M
Fort Belvoir	69	38	18	93	76	39	46	52	M
Fredricksburg	85	38	14	93	75	33	40	46	M
Hampton, Langley AFB	10	37	24	91	77	49	56	62	M
Harrisonburg	1201	38	16	91	72	18	25	31	M
Lynchburg AP	916	37	17	90	74	31	38	44	M
Newport News	41	37	22	92	77	47	54	60	M
Norfolk AP	22	36	24	91	76	42	49	55	M
Oceana, NAS	22	36	25	91	76	42	49	55	M
Petersburg	193	37	17	92	76	41	48	54	M
Quantico MCAS	12	38	21	92	76	41	48	54	M
Richmond AP	164	37	18	92	75	34	41	47	M
Roanoke AP	1193	37	17	89	72	21	28	34	M
Staunton	1201	38	16	91	72	18	25	31	M
Sterling	322	38	14	90	74	31	38	44	M
Washington, National AP	66	38	20	92	76	41	48	54	M
Winchester	727	39	10	90	74	31	38	44	M

**Table 1A**  
Outdoor Design Conditions for the United States

Location	Elevation Feet	Latitude Degrees North	Winter	Summer					
			Heating 99% Dry Bulb	Cooling 1% Dry Bulb	Coincident Wet Bulb	Design Grains 55% RH	Design Grains 50% RH	Design Grains 45% RH	Daily Range (DR)
Montpelier/ Barre	1165	44	-6	83	68	8	15	21	M
Rutland	787	43	-8	84	70	18	25	31	M
<b>Virginia</b>									
Charlottesville	870	38	18	91	74	30	37	43	M
Danville AP	572	36	16	92	73	22	29	35	M
Fort Belvoir	69	38	18	93	76	39	46	52	M
Fredricksburg	85	38	14	93	75	33	40	46	M
Hampton, Langley AFB	10	37	24	91	77	49	56	62	M
Harrisonburg	1201	38	16	91	72	18	25	31	M
Lynchburg AP	916	37	17	90	74	31	38	44	M
Newport News	41	37	22	92	77	47	54	60	M
Norfolk AP	22	36	24	91	76	42	49	55	M
Oceana, NAS	22	36	25	91	76	42	49	55	M
Petersburg	193	37	17	92	76	41	48	54	M
Quantico MCAS	12	38	21	92	76	41	48	54	M
Richmond AP	164	37	18	92	75	34	41	47	M
Roanoke AP	1193	37	17	89	72	21	28	34	M
Staunton	1201	38	16	91	72	18	25	31	M
Sterling	322	38	14	90	74	31	38	44	M
Washington, National AP	66	38	20	92	76	41	48	54	M
Winchester	727	39	10	90	74	31	38	44	M
<b>Washington</b>									
Aberdeen	12	47	28	77	62	-12	-5	1	M
Bellingham AP	158	48	21	76	64	-1	6	12	M
Bremerton	7	47	25	78	64	-4	3	9	M
Ellensburg AP	1760	47	6	91	64	-25	-18	-12	H
Everett-Paine AFB	596	47	25	76	64	-1	6	12	M
Hanford	732	46	12	96	65	-28	-21	-15	H
Kennewick	531	46	11	96	67	-18	-11	-5	H
Longview	12	46	24	85	67	0	7	13	H
Moses Lake, Larson AFB	1185	47	7	94	65	-25	-18	-12	H
Olympia AP	215	47	23	83	65	-7	0	6	H
Port Angeles	288	48	27	69	61	-4	3	9	M
Quillayute	201	47	27	74	61	-12	-5	1	M
Seattle-Boeing Fld	18	47	28	81	64	-9	-2	4	M
Seattle CO	14	47	27	82	66	0	7	13	M
Seattle-Tacoma AP	429	47	26	80	64	-7	0	6	M
Spokane AP	2366	47	7	89	61	-36	-29	-23	M
Stampede Pass	3967	47	10	74	56				M
Tacoma-McChord AFB	322	47	24	82	63	-15	-8	-2	M
Walla Walla AP	1206	46	12	95	65	-26	-19	-13	H
Wenatchee	1243	47	9	92	65	-21	-14	-8	H
Yakima AP	1052	46	11	92	64	-26	-19	-13	H
<b>West Virginia</b>									
Beckley	2504	37	4	81	69	17	24	30	M
Bluefield AP	2858	37	12	83	69	14	21	27	M
Charleston AP	939	38	11	88	73	29	36	42	M
Clarksburg	1203	39	10	90	73	25	32	38	M
Elkins AP	1948	38	5	83	70	19	26	32	M
Huntington CO	828	38	11	89	73	27	34	40	M
Martinsburg AP	556	39	14	91	73	24	33	39	M



# Manual J Don'ts

## Manual J Don'ts (Mandatory Requirements)

- Do not use *Manual J* (any version) for:
  - a) Any type of commercial application (even if located in a residential structure).
  - b) Large multi-family buildings or residential high rise structures.
  - c) A room or space containing an indoor swimming pool or hot tub.
  - d) Earth-berm or earth covered dwellings.
  - e) Solar homes that have passive features.
- Do not use MJ8<sub>AE</sub> to estimate heating and cooling loads for applications that are not compatible with the "Abridged Edition Check List" (see the page that precedes Section 1).
- Do not design for record breaking (or news making) weather conditions.
- ■ Do not add a "safety factor" to the Table 1A design conditions.
- Do not design for abnormally low or high indoor temperatures or humidity conditions (unless there is a certified medical reason for doing so).
- ■ Do not assume that there will be no internal shade on ordinary windows and glass doors (bare glass is an acceptable assumption for glass specifically installed for "day-lighting").
- Do not fail to take credit for overhangs.
- ■ Do not assume that the load for the worst case site orientation can be used for other orientations. (Rotating the dwelling on a site can change the cooling load by a half ton or more. Room airflow requirements change as the orientation changes. If the same design is used for any orientation, some rooms may have too much supply air and other rooms will not have enough supply air for temperature control and comfort.)
- Do not reduce known ceiling, wall or floor R-values "just to be safe."

- Do not fail to give full credit for the builder's effort to produce a tight envelope.
- If a local code specifies a fresh air requirement (typically an air change per hour value), do not assume the infiltration rate will satisfy this requirement and do not use the code ventilation requirement as the input value for the infiltration rate.
- Do not assume that windows and doors will be open when making the infiltration estimate.
- ■ Do not make worst case "everything is going full blast" assumptions about internal loads (all assumptions must be defensible).
- ■ Do not add extra occupancy loads for "entertaining groups of people."
- Do not add internal loads for special events.
- Do not arbitrarily assume that ducts are unsealed (i.e., do not assume that they are leaky).
- Do not fail to give full credit for efforts to provide tight, properly insulated ducts.
- Do not apply "safety factors" during any stage of the load calculation process.
- ■ Do not apply a safety factor to the final answer or to the equipment selection procedure.

## 2-4 Improper Practices

Do not use *'rules-of-thumb'*. The idea that the required equipment capacity equals the floor area multiplied by some magic number has resulted in many customer complaints and legal actions. Heating and cooling loads depend on individual circumstances. Floor area to tonnage ratios for the U.S. housing stock can range from less than 500 SqFt per Ton to more than 1,200 SqFt per Ton. Efficient single family detached homes with a normal amount of well distributed glass typically fall in the 700 to 1,200 range. Limited exposure dwellings with concentrated glass (that produces a time-of-day peak) may fall in the 500 to 800 range. Homes with exceptional features can be all over the map in this regard. Just rotating a home on the site can change the ratio by 100 to 400 SqFt per Ton.



# Electronic plan submittal

Residential plans and HVAC manual Js may be submitted by a re-writable CD or PDF by email. If emailing please keep to less than 10 mb and send to [codecomp@james-city.va.us](mailto:codecomp@james-city.va.us). State: contractor name, job address, lot number and application number if it has been assigned by the JCC staff. If greater than 10 mb please supply by re-writable CD or with your or our FTP site.

When submitting please submit in the following order with.

## **APPLICATION**

### **Manual Js:**

- Submit in portrait style
- Submit right side up turned all one way for viewing
- 

Sheet 1- "Residential Plans Examiners Review form"

Sheet 2- Project summary showing design information

Sheet 3- Sheet showing Heating/cooling equipment /By room CFM

Sheet 4- Layout

Sheet 5- Friction rate worksheet

Sheet 6- Equipment info

Sheet 7- Site orientation

Sheet 8- Any letters justifying the use of equipment that does not meet ACCA percentages

Any Additional sheets- equipment specs etc